IS 12257-2 (1992): Pneumatic measurement, Part 2: Design features of instruments working in high pressure range [PGD 25: Engineering Metrology]

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IS 12257 (Part 2) : 1992
(Reaffirmed 2006)

भारतीय मानक

वाग्वीय मापन

भाग 2 उच्चदाब रेंज में काम करने वाले उपकरणों के डिजाइन लक्षण

Indian Standard

PNEUMATIC MEASUREMENT

PART 2 DESIGN FEATURES OF INSTRUMENTS WORKING IN HIGH PRESSURE RANGE

UDC 531·713·082·32

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 1992

Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Engineering Metrology Sectional Committee had been approved by the Light Mechanical Engineering Division Council.

Air gauging has been gaining wider acceptability in industry because of its accuracy, consistency and reliability. These can be used for on line measurement of parts as they are being machined and take corrective actions. It mainly consists of gauging element and an indicating instrument. Gauging elements have been classified as 'non-contact' type and 'contact' type. Various instruments covered in the standard operate at input pressure $\geqslant$ 50 kPa.

This standard has been published in various parts. Other parts of this standard are:

Part 1 General information on principles and method

Part 3 Parameters of instruments working on high pressure

Part 4 General information and examples of application

In the preparation of this standard assistance has been derived from the following:

DIN 2271 Part 2, Deutsches Institut für Normung, DIN

Glossary of terms and definition used in air gauging — NPL UK

Principles of pneumatic gauging — NPL UK

Indian Standard

PNEUMATIC MEASUREMENT

PART 2 DESIGN FEATURES OF INSTRUMENTS WORKING IN HIGH PRESSURE RANGE

1 SCOPE

This standard deals with pneumatically operated instruments for dimensional measurements consisting of a gauging element and an indicating instrument which operates on an input pressure of pl $\geqslant$ 50 kPa (0·5 bar) that is high pressure according to IS 12257 (Part 1) : 1987.

2 REFERENCE

IS 12257 (Part 1) : 1987 'Pneumatic measurement : Part 1 General information on principles and methods' is necessary adjuncts to this standard.

3 GAUGING ELEMENT

Gauging elements are used to determine the variable dimension on the component being tested. They are basically divided into gauging elements of the non-contact type and those which operate with mechanical contact. They are suitable for measurement of internal and external dimensions as well as form and positional variations.

3.1 Gauging Elements Non-contact Type

In the case of gauging elements of non-contact, the air flows from the measuring or the sensing jet directly on to the surface of the object being tested which serves as the deflector plate [*see* IS 12257 (Part 1) : 1987].

3.1.1 *Air Plug Gauge — Open Jet*

The open jet air plug gauge is used for internal measurement (that is, holes, *see* Fig. 1). It generally has two measuring jets on its circumference (in special cases there may be several measuring jets).

3.1.2 *Air Ring Gauge and Snap Gauge — Open Jet*

The open jet air ring gauges are used for external measurements (that is, shafts, *see* Fig. 2). As in the case of air plug gauge, these generally have two measuring jets or several measuring jets.

3.1.3 *Air Probe — Open Jet*

The open jet air probe with a standard clamping diameter of 8 h6 is used on measuring tables in fixtures, etc, that is, on comparator stand as a dial gauge (*see* Fig. 3).

3.2 Gauging Element — Contact Type

In the case of mechanical contact gauging element, mechanical contact is made with the object under test. The displacement of the contact due to dimensional change brings about a change of gap between the measuring jet and a deflector plate. The measuring jet and the plate are connected to form an assembly.

3.2.1 *Mechanical Contact Air Plug Gauge*

Each of the measuring jet of a mechanical contact air plug gauge (*see* Fig. 4) has a ball at its end which is pressed outward against the surface of the object being tested by the air flowing out of a spring. Mechanical air plug gauges are used for internal measurements.

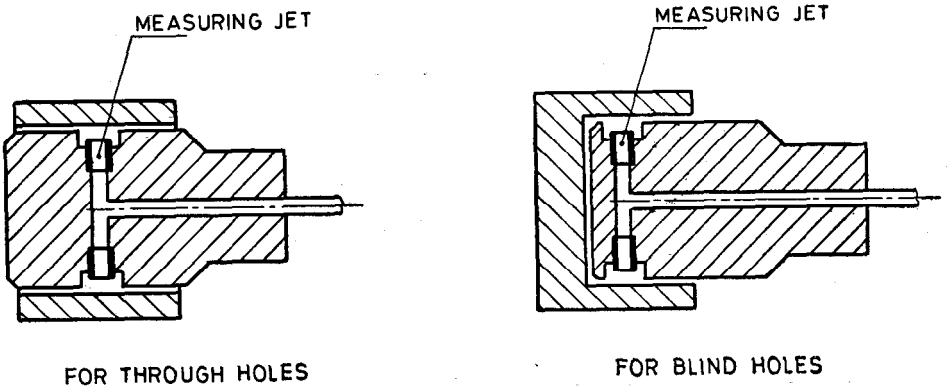

FIG. 1 AIR PLUG GAUGE — OPEN JET

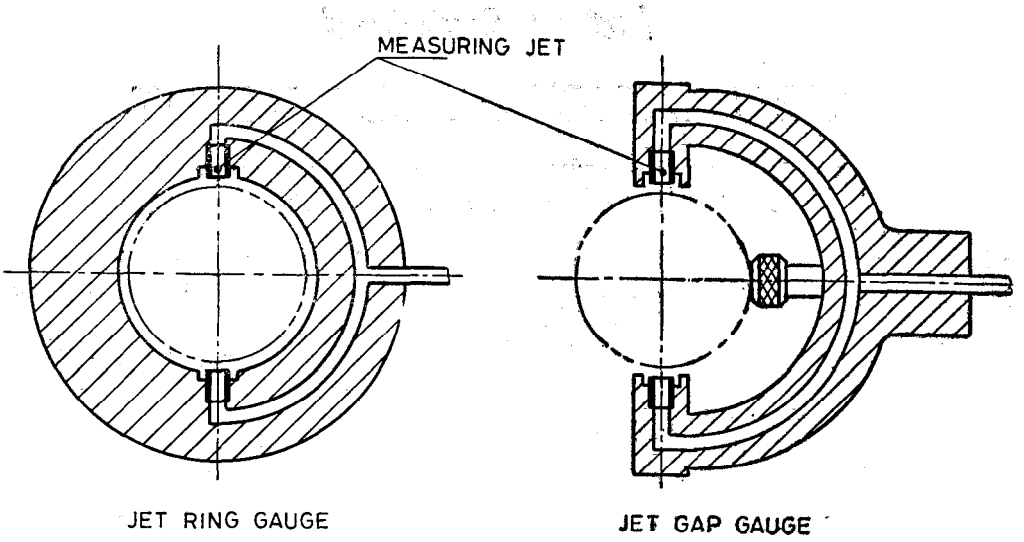

FIG. 2 AIR RING GAUGE AND SNAP GAUGE — OPEN JET

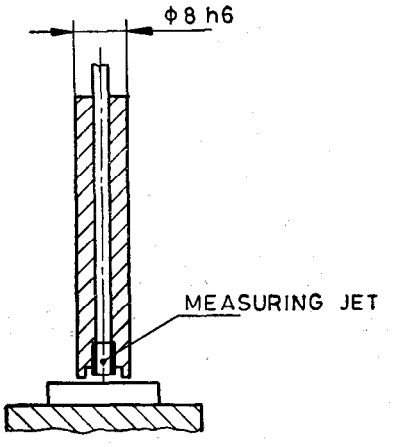

FIG. 3 AIR PROBE — OPEN JET

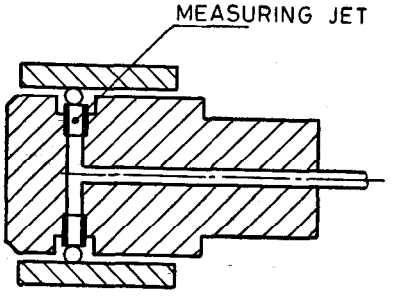

FIG. 4 MECHANICAL CONTACT AIR PLUG GAUGE

3.2.2 *Mechanical Contact Air Plug Gauge — Lever or Leaf Spring Contact Air Plug Gauge*

Each of the measuring jet is fitted with a movable probe (leaf spring or a lever) which is pressed against the surface of the object being tested (*see* Fig. 5).

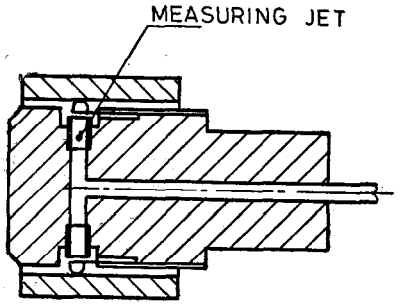

FIG. 5 MECHANICAL CONTACT AIR PLUG GAUGE — LEVER OR LEAF SPRING CONTACT AIR PLUG GAUGE

3.2.3 *Mechanical Contact Air Ring Gauges*

These are designed similarly to the mechanical contact air plug gauges according to **3.2.1** and **3.2.2.**

3.2.4 *Mechanical Contact Air Probe*

Mechanical contact air probe measure the dimension by mechanical contact with the surface of the object being tested. The displacement, due to size variation of the pin brings about a gap change in the probe between the measuring jet and the deflector plate (*see* Fig. 6).

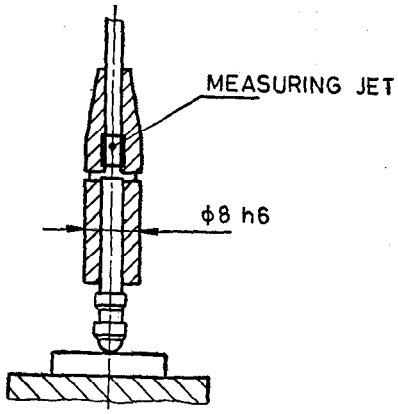

FIG. 6 MECHANICAL CONTACT AIR PROBE

4 INDICATING INSTRUMENTS

Indicating instruments are basically magnifiers used to magnify the dimensional change detected by the gauging element. That part of the circuit which includes the indicator [*see* IS 12257 (Part 1) : 1987] and the pressure regulator generally forms an integral part of the indicating instrument.

4.1 Column Type Indicating Instruments with Straight Vertical Scale

4.1.1 In a column type indicating instrument which uses the volumetric flow method (*see* Fig. 7), the measured value is indicated on a straight vertical scale by means of a floating body in a measuring tube. This measuring tube is a clear glass tube with a calibrated internal diameter which widens out towards the top in accordance with a specific function that is the magnification of the instrument. The floating body floats freely within the measuring tube and stabilises at a certain height according to the flow. This flow changes due to the change of clearance between the gauging jet and the deflector plate or the surface of the object being tested.

4.1.2 In a column type indicating instrument which uses the pressure measuring method (*see* Fig. 8), the straight vertical scale of a fluid manometer serves as the indicator.

4.2 Indicating Instrument with Circular Dial

(*See* Fig. 9, 10 and 11).

Indicator or the indicating instrument [as described in IS 12257 (Part 1) : 1987] is in this case a pressure gauge, dial gauge or other similarly operating instrument.

5 REGULATING AND ADJUSTING ELEMENTS

5.1 Pressure Regulator

The pressure regulator reduces and regulates the supply pressure in the line to the measuring instrument to the system pressure of the measuring instrument with a required degree of accuracy.

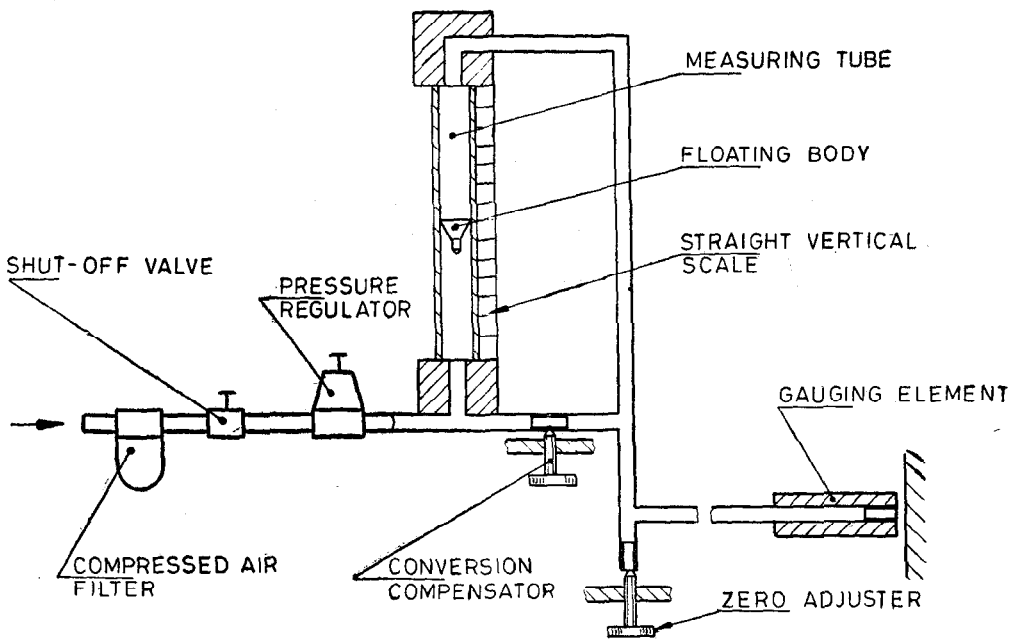

FIG. 7 COLUMN TYPE INDICATING INSTRUMENT WITH STRAIGHT VERTICAL SCALE

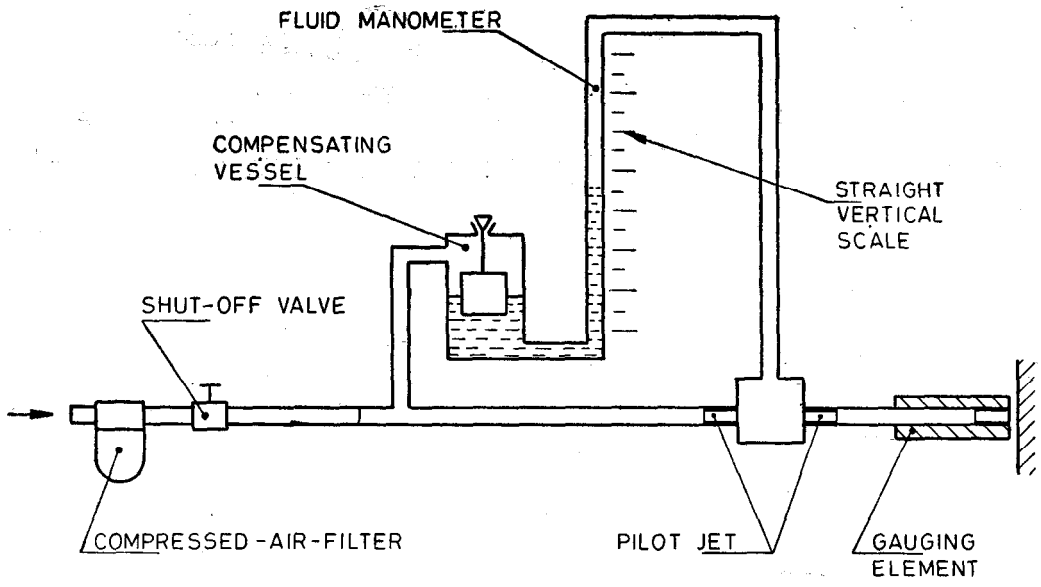

FIG. 8 COLUMN TYPE INDICATING INSTRUMENT USING PRESSURE MEASURING METHOD

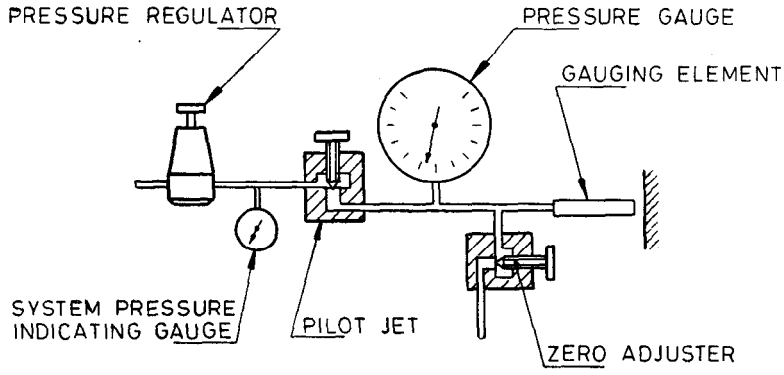

FIG. 9 INDICATING INSTRUMENT USING THE PRESSURE MEASURING METHOD WITH A SIMPLE PRESSURE GAUGE

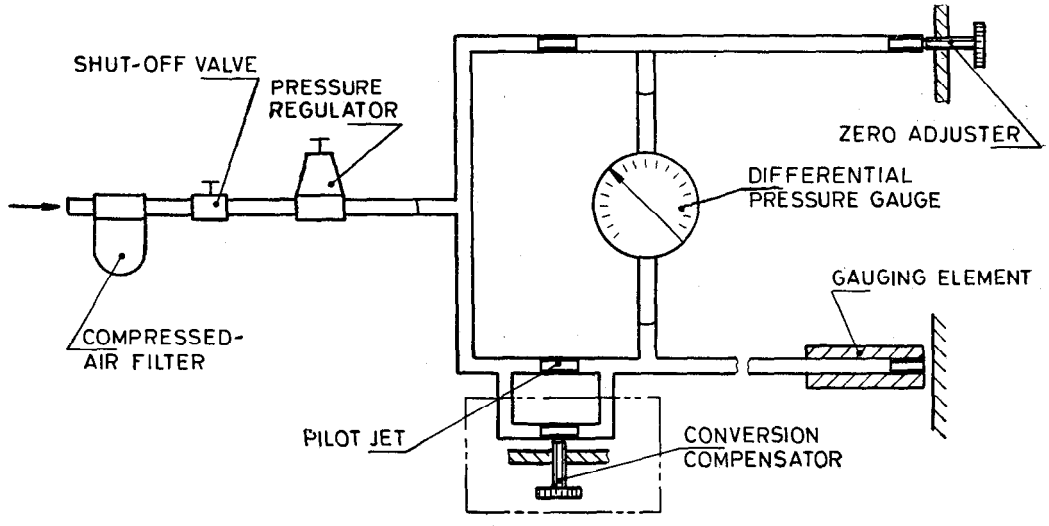

FIG. 10 INDICATING INSTRUMENT USING THE PRESSURE MEASURING METHOD WITH A DIFFERENTIAL PRESSURE GAUGE

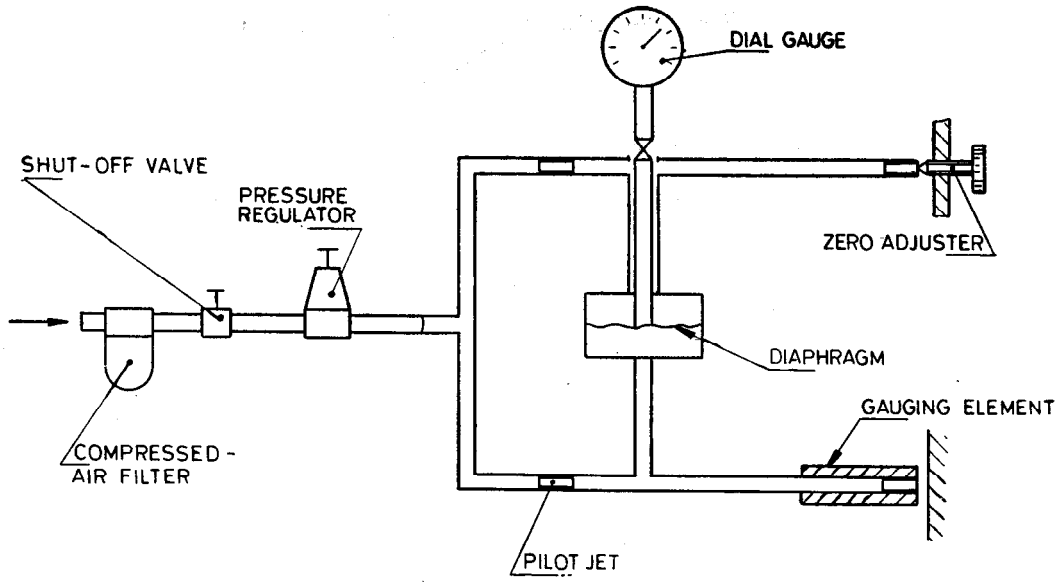

FIG. 11 INDICATING INSTRUMENT USING THE PRESSURE MEASURING METHOD WITH A DIAL GAUGE

5.2 Zero Adjuster

The zero adjuster alters the position of the zero either pneumatically with the linearity range or by adjusting the mutual position of the indicator and scale.

5.3 Compensation

In the case of indicating instruments with compensation, the conversion can be altered in small ranges to suit the gauging element or the indicating instrument.

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